

**97. Two Cambrian Trilobites from the Parara
Limestone in the Yorke's Peninsula,
South Australia.**

By Teiichi KOBAYASHI.

(Comm. by T. KATO, M.I.A., Oct. 12, 1942.)

While I was with the U.S. National Museum at Washington, D. C., I was given the opportunity, through the kind courtesy of Dr. C. E. Resser of that Museum, to make duplicates of the plaster-casts of the Parara trilobites. From these it was found that the five species of trilobites which have been described from the limestone ought to be united into two species, namely *Pararaia tatei* and *Yorkella australis*, as described below. Because *Pararaia* and *Yorkella*, both new genera, are each represented by the single species above mentioned, their generic distinctions are given in their specific description. Beside them there are two casts of an undescribed protolenid resembling *Protolenus paradoxoides* Matthew. This however is merely illustrated in figure, because it might possibly be mislabeled. These casts were a great help in this study because Etheridge's illustrations which were refigured from the types of Woodward and Tate are quite different from the original.

Yorkella australis (Woodward). Figures 5-6, 9-10.

- 1884. *Conocephalites australis* Woodward, Geol. Mag. 1, (3), p. 344, Pl. XI, figs. 2a-b.
- 1888. *Ptychoparia howchini* Etheridge, Trans. Roy. Soc. S. Austr. 22, p. 2, Pl. 4.
- 1915. *Ptychoparia* (?) *australis* Etheridge, Trans. Roy. Soc. S. Austr. 43, p. 384, Pl. 39, fig. 6.
- 1915. *Ptychoparia* (?) *howchini* Etheridge, ibid. p. 385, Pl. 40, fig. 7.
- 1935. *Solenopleura australis* Kobayashi, Jour. Fac. Sci. Imp. Univ. Tokyo, sect. 2, vol. 4, pt. 2, pp. 262, 265, Pl. 24, figs. 18-19.
- 1936. *Protolenus howchini* Whitehouse, Mem. Queensland Mus. vol. 11, pt. 1, p. 73, foot-note.
- 1939. *Protolenus australis* Whitehouse, Mem. Queensl. Mus. vol. 40, pt. 3, p. 214.

Description.:—Glabella very large, strongly convex, especially in the fore-part where it abruptly droops down. It is unusually expanded at the third lateral lobes, gradually narrows forward, broadly rounded in front and provided with three pairs of shallow-lateral furrows which are disconnected on the axis. These pairs of furrows, as they near the posterior, become stronger and more oblique to the axis. Occipital furrow considerably deeper than these; neck-ring thick in the middle and a short median spine issues from a point on the posterior side of the ring. Dorsal furrow intermediate in depth between the lateral and occipital ones. Fixed cheeks moderately convex and not very broad; eye-ridges distinctly elevated and continue to eye-bands which are relatively large for solenopleurids. Frontal limb very short, if present; frontal border defined clearly by a narrow furrow on its posterior side, relatively thick but only slightly convex. Facial sutures widely diverging

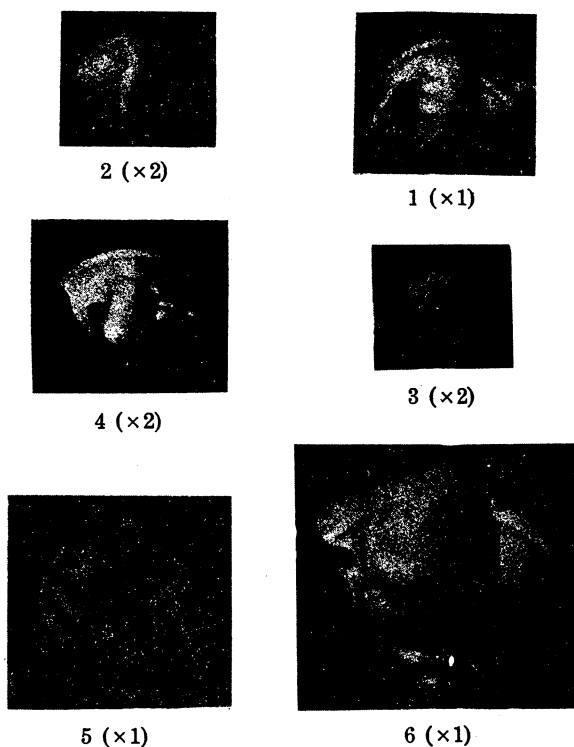
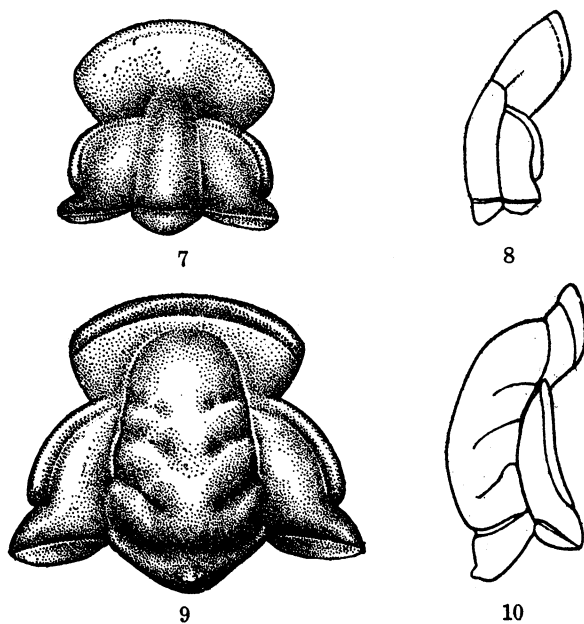


Fig. 1, *Protolenus* aff. *paradoxoides* Matthew.
 Figs. 2-3, (?) 4. *Pararaia tatei* (Woodward).
 Figs. 5-6. *Yorkella australis* (Woodward).



Figs. 7-8. *Pararaia tatei* (Woodward).
 Figs. 9-10. *Yorkella australis* (Woodward).

from each other in front of the eyes; their posterior branches appear to be short and diagonal. Surface minutely but densely granulated.

Observations.:—One of the two casts at hand (Kobayashi, 1935, pl. 24, fig. 19) appears to be more similar to Woodward's than to Etheridge's illustration of *australis*. The other (pl. 24, fig. 18) unquestionably belongs to the species as the preceding. And these casts agree with Etheridge's *howchini* in most characteristics. Therefore I am led to the conclusion that *howchini* is a synonym of *australis*.

Comparison.:—Considering its large convex glabella, shallow lateral furrows, distinct eye-ridges, granulated test and several other features, it is undeniable that this species is much closer to *Solenopleura* than to any other genus of the Solenopleuridae. Therefore I placed it formerly in the said genus, but now I am led to the conclusion, after a careful comparison with the species of *Solenopleura* s. str., that it ought to be eliminated from the group of trilobites typified by *Solenopleura holometopa*. Its eyes are very much larger and its anterior border is not as strongly convex or bent up as sharply in the front of the glabella as frequently seen in *Solenopleura*. The divergence of the anterior branches of the facial sutures also constitutes a point of marked dissimilarity. It somewhat resembles *Dokimocephalus gregori* but its eyes are larger, eye-ridges more distinct and its glabella has three lateral furrows, instead of two as in *D. gregori*. The rostral spine characteristic of *Dokimocephalus* is absent whereas the occipital spine absent in that genus is present in this.

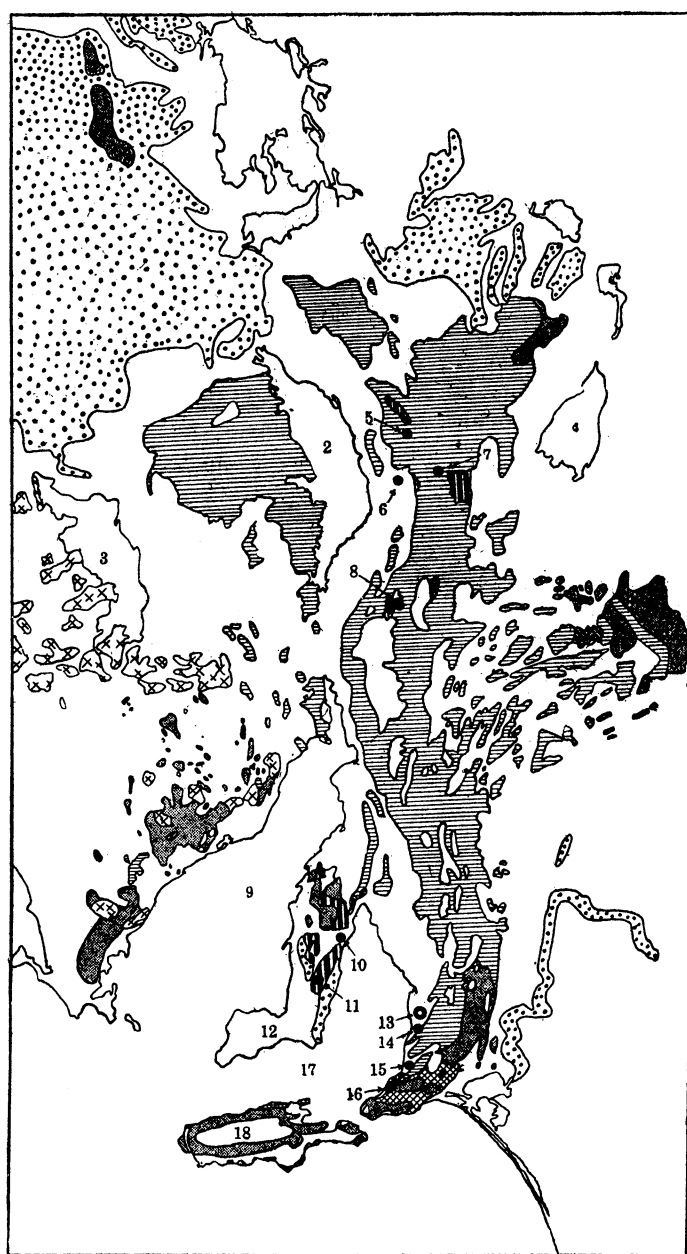
Whitehouse suggested *Protolenus* for it, but the narrow fixed cheeks, medium sized eyes, drooping frontal lobe of glabella, the course of facial suture and many other characteristics readily distinguish it from all of the known protolenids.

Occurrence.:—Parara limestone at Ardossan, Yorke's peninsula.

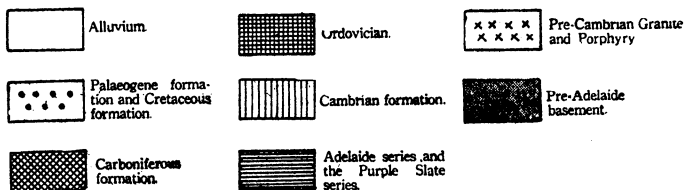
Pararaia tatei (Woodward). Figures 2-3, 4 (?), 7-8.

- 1884. *Dolichometopus tatei* Woodward, Geol. Mag. 1, p. 343, Pl. 2, fig. 3.
- 1892. *Microdiscus subsagittatus* Tate, Trans. Roy. Soc. S. Austr. 15, p. 187, Pl. 2, fig. 12.
- 1892. *Olenellus pritchardi* Tate, ibid. p. 87, Pl. 2, fig. 1.
- 1909. *Dolichometopus tatei* Basedow, Zeits. deutsch. geol. Gesell. 61, p. 313.
- 1909. *Microdiscus subsagittatus* Basedow, ibid. p. 313.
- 1916. *Redlichia tatei* Walcott, Smiths. Misc. Coll. 64, p. 359.
- 1919. *Ptychoparia* (?) *tatei* Etheridge, Trans. Proc. Roy. Soc. S. Australia, 43, p. 382, Pl. 39, fig. 2, 3.
- 1919. *Ptychoparia* (?) *subsagittatus* Etheridge, ibid. p. 383, pl. 39, fig. 4-5.
- 1935. *Lorenzella tatei* Kobayashi, Jour. Fac. Sci. Imp. Univ. Tokyo, sect. 2, vol. 4, pt. 2, pp. 122, 209, pl. 24, fig. 7.
- 1942. "*Lorenzella*" *tatei* Kobayashi, ibid. sect. 2, vol. 6, pt. 10, p.

Description.:—Cephalon nearly semicircular; glabella subcylindrical, very slowly tapering forward, rounded in front, a little longer than two-thirds of the cranium, regularly convex and distinctly elevated above the cheeks; dorsal furrow distinct on the lateral sides of the glabella but becomes obscure in the glabellar front where a preglabellar boss exists; no lateral furrows; occipital furrow on the contrary deep and straight; occipital ring thickened in the middle; eye-band thick, located more or less posteriorly and connected with the glabella by an eye-ridge



1. Lake Eyre
2. Lake Torrens
3. Lake Gairdner
4. Lake Frome
5. Beltana and Ajax in its north
6. Parachilna
6. Bilman and Wirralpa
7. Wilson and Kanyaka
8. Spencer's Gulf
9. Ardrossan
10. Curramulka
11. Yorke's Peninsula
12. Adelaide
13. Brighton
14. Sellicks
15. Normanville
16. St. Vincent Gulf
17. Kangaroo Island.



of the same breadth; the band and ridge describe about a quarter of a circle with the terminal point of the neck-furrow at its center; fixed cheek inside of the circle only a little convex and nearly horizontal; preglabellar area on the other hand inclined steeply, gently convex and frequently divided by a shallow marginal groove into the frontal limb and rim; in the middle of the limb there is a boss-like elevation which appears somewhat elongated axially and more elevated on its posterior side; its outline is however not distinctly defined. Facial sutures anterior to the eyes running antero-laterally; those posterior to the eyes probably short and diagonal. Surface smooth.

Observation.:—Woodward's type and Tate's two types were refigured by Etheridge in addition to one of Tate's which had not been illustrated before. The second illustrations are however different from the originals in many respects. Among five plaster-casts at hand two can be exactly identified with Etheridge's figs. 4 and 5 and another two look similar to his figures 2 and 3 but do not coincide. None of these casts including the one unquestionably taken from the specimen in fig. 5 has such lateral furrows as shown in his fig. 5. One cranium (fig. 4 or Kobayashi, 1935, p. 34, fig. 7) is similar to Etheridge's figs. 3 but looks a little broader than the others. All of them have the preglabellar boss but it is not equally elevated and never very high. The marginal furrow is either faintly seen or indiscernible. The convexity of the cranium and the outline of the glabella vary to some extent from one specimen to another. The strength of the eye-ridge also varies. If many specimens are procured and an accurate comparison is made, there is bound to be two or more species of the same genus. The above mentioned broad cranium in particular, I think, probably does not belong to the same species with the others.

Comparison.:—Etheridge has already suggested that *Dolichometopus tatei*, *Microdiscus subsagittatus* and *Olenellus pritchardi* ought to be united in one or two species. I agree with him in uniting them into one species, and also in not being satisfied with its previous generic reference. Various genera—*Microdiscus*, *Olenellus*, *Redlichia*, *Dolichometopus* and *Ptychoparia*—were suggested for it. While none of these is very closely allied, it has features typical of the Ellipsocephalidae.

On the previous occasion I suggested *Lorenzella* for its generic position, noting that its eyes are located too posteriorly for the genus. The presence of the distinct eye-ridge is also a noteworthy feature distinguishing it from the genus. Therefore I am inclined to believe now that this species is appropriately distinguished from *Lorenzella*. Hence a new name, *Pararaia*, is proposed here.

It has some features resembling protolenids though this resemblance is not very marked. There is no protolenids having a semicircular cephalon, and moreover the eyes are invariably much larger in them.

Occurrence.:—Parara limestone at Curramulk, Yorke's peninsula.

List of Papers

to which reference was made; most of the papers cited in my paper (1940 c) are omitted; a complete review and the bibliography on the Australian graptolites are found in Keble and Benson's paper (1939).

H. Basedow (1919), "Beitrage zur Kenntnis der Geologie Australiens." *Zeitsch. deutsch. geol. Gesell.*, vol. 61.

- R. & W.R. Bedford (1934), New Species of Archaeocyathinae and other organisms from the Lower Cambrian of Beltana, S. Australia. *Mem. Kyancutta Mus. no. 1.*
- R. & W.R. Bedford (1936), Further Notes on Archaeocyathini (Cyathospongia) and other organisms from the Lower Cambrian of Beltana, S. Australia. *ibid. no. 2.*
- R. & J. Bedford (1936), Further Notes on Cyathospongia (Archaeocyathi) and other organisms from the Lower Cambrian of Beltana, S. Australia. *ibid. no. 3.*
- T. Blatchford (1927), The Geology of Portions of the Kimberley Division with Special reference to the Fitzroy Basin and Possibilities of the Occurrence of Mineral Oil. *West Austr. Geol. Surv. Bull. 93.*
- F. Chapman (1914), Australian Fossils.
- F. Chapman (1918), Ostracoda from the Upper Cambrian limestone of South Australia, etc. *Pröc. Roy. Soc. Vict. N.S. vol. 31.*
- F. Chapman (1940), On a New Genus of Sponges from Cambrian of the Flinders Ranges, South Australia. *Trans. Roy. Soc. S. Austr. vol. 64.*
- E. de C. Clarke (1938), Middle and West Australia. *Reg. Geol. der Erde. Bd. 1, Abschn. 7.*
- T. W. E. David (1927), Note on the Geological Horizon on the Archaeocyathinae. *Trans. Roy. Soc. S. Austr. vol. 51.*
- T. W. E. David (1932), A New Geological Map of the Commonwealth of Australia and its Explanatory Notes.
- R. Etheridge, jr. (1890), On Some Australian species of the Family Archaeocyathinae. *Trans. Proc. Roy. Soc. S. Austr. vol. 13.*
- R. Etheridge, jr. (1905), Additions to the Cambrian Fauna of South Australia. *ibid. vol. 29.*
- R. Etheridge, jr. (1917), *Girvanella* in the Cambrian Rocks of Northwest Australia. *West Austr. Geol. Surv. Bull. 72.*
- A. H. Foord (1890), Description of Fossils from the Kimberley District, Western Australia. *Geol. Mag. dec. 3, vol. 7.*
- J. W. Gregory (1902), The Heathcoteian—a pre-Ordovician Series—and its Distribution in Victoria. *Proc. Roy. Soc. Vict. N.S. 15.*
- W. Howchin (1904), The Geology of Mount Lofty Ranges. *Trans. Roy. Soc. S. Austr. vol. 28.*
- W. Howchin (1907), A General Description of the Cambrian Series of South Australia. *Austr. Ass. Adv. Sci. vol. 11.*
- W. Howchin (1918), Geology of South Australia. Adelaide.
- A. M. Howitt (1923), Phosphate Deposits in the Mansfield District. *Bull. Geol. Surv. Vict. no. 46.*
- R. A. Keble and W. N. Benson (1939), Graptolites of Australia: Bibliography and History of Research. *Mem. Nat. Mus. Melbourne, no. 11.*
- T. Kobayashi (1933), Faunal Study on the Wanwanian (Basal Ordovician Series with Special Notes on the Ribeiridae and the Ellesmereoceroids. *Jour. Fac. Sci. Imp. Univ. Tokyo, sect. 2, vol. 3, pt. 7.*
- T. Kobayashi (1935), The Cambro-Ordovician Formations and Faunas of South Chosen. Palaeontology, Pt. 3. *ibid. vol. 4, pt. 2.*
- T. Kobayashi (1936 A), Notes on Some Ordovician Faunas of Tasmania. *Japan. Jour. Geol. Geogr. vol. 12.*
- T. Kobayashi (1936 B), The World-Wide Distribution of the Ribeirioid in the Ordovician Period. *Jour. Geol. Soc. Japan, vol. 43.*
- T. Kobayashi (1937), On *Salterella conulata* and its Allies. *Japan. Jour. Geol. Geogr. vol. 14.*
- T. Kobayashi (1939), Restudy on Lorenz's *Raphistoma bröggeri* from Shantung with a Note on *Pelagiella*. *Jub. Publ. Comm. Prof. Yabe's, vol. 1.*
- T. Kobayashi (1940 A), Lower Ordovician Fossils from Juneë, Tasmania. *Pap. Proc. Roy. Soc. Tasm., 1939.*
- T. Kobayashi (1940 B), Lower Ordovician Fossils from Caroline Creek, Near Latrobe, Mersey River District, Tasmania. *ibid. 1939.*

- T. Kobayashi (1940 C), On the Ordovician Shelly Faunas in the Southwestern Pacific Province. *Japan. Jour. Geol. Geogr.* vol. 17.
- T. Kobayashi (1940 D) On the Occurrence of *Taihungshania*, a characteristic Arenigian Trilobite, in New Zealand. *ibid.* vol. 17.
- T. Kobayashi (1942), On the Dolichometopinae. *Jour. Fac. Sci. Imp. Univ. Tokyo*, sect. 2, vol. 6, pt. 10.
- T. Kobayashi (1942), The Rakuroan Complex of the Shansi Basin and its Surroundings. *Japan. Jour. Geol. Geogr.* vol. 18.
- A. N. Lewis (1940), Geology of the Tyenna Valley. *Pap. Proc. Roy. Soc. Tasm.*, 1939.
- G. F. Matthew (1896), The *Protolenus* Fauna. *Trans. N. Y. Acad. Sci.* vol. 14.
- D. Mawson, & C. T. Madigan (1930), Pre-Ordovician Rocks of the McDonnell Ranges (Central Australia). *Q. J. G. S. London*, vol. 86.
- C. E. Resser (1938), Fourth Contribution to Nomenclature of Cambrian Fossils. *Smiths. Misc. Coll.* vol. 97.
- L. F. Spath (1936), So-Called *Salterella* from Cambrian of Australia. *Geol. Mag. N.S.* vol. 73.
- R. Tate (1882), Silurian Fossils from the Parara limestone near Ardrossan. *Trans. Proc. Rep. Roy. Soc. S. Austr.* vol. 4.
- R. Tate (1892), Cambrian Fossils of South Australia. *Trans. Roy. Soc. S. Austr.* vol. 15.
- T. G. Taylor (1910), Archaeocyathinae from the Cambrian of South Australia with an account of the Morphology and Affinities of the Whole Class. *Mem. Roy. Soc. S. Austr.* vol. 2.
- C. Teichert (1939), The Nautiloid *Bathomoceras* Banande. *Trans. Roy. Soc. S. Austr.* vol. 63.
- P. Teilhard de Chardin (1931), On an enigmatic Pteropod-like Fossil from the Lower Cambrian of Southern Shansi, *Biconulites grabaui*, nov. gen. et sp. *Bull. Geol. Soc. China*, vol. 10.
- E. O. Ulrich & R. S. Barsler (1931), Cambrian Bivalved Crustacea of the Order Conchostraca. *Proc. U. S. Nat. Mus.* vol. 78.
- C. D. Walcott (1908), Cambrian Brachiopoda: Description of New Genera and Species. *Smiths. Misc. Coll.* vol. 53.
- C. D. Walcott (1912), Cambrian Brachiopoda. *U. S. Geol. Surv. Monogr.* 51.
- C. D. Walcott (1925), Cambrian and Ozarkian Trilobites. *Smiths. Misc. Coll.* vol. 75.
- F. W. Whitehouse (1936, 39), The Cambrian Faunas of North Eastern Australia. *Mem. Queensl. Mus.* vol. 11, pts. 1 & 3.
- T. H. Withers (1926), Catalogue of the Machaeridia. *Brit. Mus. (Nat. Hist.)*.
- H. Woodward (1884), Notes on the Remains of Trilobites from South Australia. *Geol. Mag. N.S. Dec.* 3, vol. 1.
-